

Extracurricular activity: **Rhythm and Mathematics Through Body Percussion**

Teacher: Daniel Pozo.

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Age students: 6 to 12 years.

Language: Spanish English.

Duration: 2 hours a week (October 2017 / May 2018)

Group activity: between 12 and 15 students

Price: to be determined with the center € / month

Goals:

This activity is entirely dedicated to a new way of explaining mathematics and linking them with music, in particular with rhythm, to make mathematics more attractive to the student and, in turn, to improve motor skills and coordination with music, understanding what their Relationship with mathematics. Through the method of corporal percussion created by Keith Terry the goal is to relate certain polyrhythms, Afro-Cuban keys and keys of flamenco from a writing not related to the conventional musical solfeo but with the basic mathematical fractions and their geometric representation.

Elements to study:

Language of body percussion following the method of Keith Terry- How to represent numbers 1 to 9

Representation and visualization of bars ($2/4$, $3/4$, $4/4$, $5/4$, etc) and their subdivisions (2 eighth note, 3 triplets, 4 sixteenth notes, etc.) with pictures, clocks, and non-musical visual forms.

Using prior knowledge in group representation of polyrhythms (2 on 3, 3 on 2, 4 on 3, 4 on 5, 4 on 7, etc.) using basic mathematical concepts of common denominator. Fractions.

After the visual representation of compasses in pictures, through corporal percussion, the realization of different keys of modern music from africa, brazil, etc. is proposed. (They are Cuban, Rumba, Bossa-Nova, Shiko, Bembé, Yoruba, etc.)

In the same way it is proposed to use the visualization of the rhythm and its subdivisions in pictures that help the interpretation of the compass with corporal percussion to interpret different keys within flamenco. (Fandango, soleá, bulería, Seguiriya, guajira, etc.)

Each of these rhythms of both flamenco and modern music from Africa, Brazil, etc. are represented in the clock ($1 \text{ to } 12 = 3/4$ or $1 \text{ to } 16 = 4/4$) with a characteristic geometric form for their study.

Example:

After several classes / sessions play and represent through body percussion the numbers between 1 and 9 performing basic sets of addition and subtraction. A $\frac{3}{4}$ bar is shown with a conventional clock of needles. Each time of this fraction is a quarter note. Each quarter note is divisible into two eighth notes. Each eighth note is divisible into 2 sixteen notes. (3 times X 4 sixteen notes = 12 sixteen notes). Before reaching this point each of the musical elements (quarter note, eighth note and sixteenth notes) will be represented both his musical way with examples of conventional life as coins (\$ 1, 50 cents, 25 cents, etc.) Chocolate bars, etc. This clock represents the totality of times and will propose to create a polyrhythm of 4 on 3.

To perform this exercise the class will be divided into 2 groups. The group1 at my signal will begin to perform through the body percussion groups of 3 (Palm, Right hand chest, Left hand chest) At my signal group2 will start at the moment of the palm generating a group of 4 (Palm, Right hand Chest, left hand chest, right hand leg). That is, group1 will do 4 repetitions and group2 3 repetitions to complete the cycle and complete sound.

Bibliography:

DVD:

Body Music, Part 1 with Keith Terry Instructional DVD (2002)

Body Music, Part 2 with Keith Terry Instructional DVD(2007)

Books and research papers:

Godfried T. Toussaint, "El compas flamenco: A phylogenetic analysis," *Proceedings of BRIDGES: Mathematical Connections in Art, Music, and Science*, Southwestern College, Winfield, Kansas, July 30 to August 1, 2004, pp. 61-70. (with M. Diaz-Bañez, G. Farigu, F. Gomez, D. Rappaport)

Godfried T. Toussaint, "The Euclidean algorithm generates traditional musical rhythms," *Proceedings of BRIDGES: Mathematical Connections in Art, Music, and Science*, Banff, Alberta, Canada, July 31 to August 3, 2005, pp. 47-56.

Godfried T. Toussaint, "[The Geometry of Musical Rhythm](#)" Lecture given at Jilin University in Changchun, China, December 28, 2009.

Godfried Toussaint, "Mathematical features for recognizing preference in Sub-Saharan African traditional rhythm timelines," *Proceedings of the 3rd International Conference on Advances in Pattern Recognition*, University of Bath, Bath, United Kingdom, August 22-25, 2005, pp. 18-27.

Godfried T. Toussaint, "A mathematical analysis of African, Brazilian, and Cuban *clave* rhythms," *Proceedings of BRIDGES: Mathematical Connections in Art, Music and Science*, Townson University, Towson, MD, July 27-29, 2002, pp. 157-168. Also the long version is Technical Report SOCS-02.2, May 2002.

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